

## Prevalence of headache and associated risk factors among radiology department

Hussain A Al Ghadeer<sup>1✉</sup>, Jaafer J Al Obaid<sup>2</sup>, Wejdan H Al Musallam<sup>3</sup>, Khadijah A Al Ali<sup>3</sup>, Qassim A Al Hassan<sup>2</sup>

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### Author Affiliation:

<sup>1</sup>Paediatric department, Maternity and Children Hospital, AlAhsa, Saudi Arabia

<sup>2</sup>Radiology department, King Fahad Hospital-Hofuf, AlAhsa, Saudi Arabia

<sup>3</sup>Radiology department, College of Medicine, King Faisal University, AlAhsa, Saudi Arabia

### ✉Corresponding author

Paediatric department, Maternity and Children Hospital, AlAhsa, Saudi Arabia  
Email: Hu.alghadeer@gmail.com

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### ABSTRACT

**Background:** Headache is considered as disabling disorder. It has significant impact on the quality of life and functional impairment. Health care providers in radiology department within different qualification are expected to experience health-related problems during their life due their nature of works and spending hours on screening. So, this study aims to identify the prevalence of headache and its associated risk factors among radiology department. **Methodology:** A cross-sectional study was conducted from July to October in multicenter at radiology department with different qualification: doctor, technician, and nurse in AlAhsa, Saudi Arabia. The data were collected through a self-administrated questionnaire that fulfilled paper based or online. Considering the chi-square significant is in  $P < 0.05$ . **Results:** A total of 133 workers in radiology department fulfilled the inclusion criteria. The analyzed population presented a mean age of  $30.6 \pm 11.8$  years; female represented 72.2 % of the participants. Half of the radiology department is 52.6% spending more than 6 hours on computer. Exact of 106 (79.7%) participant experience headache that lasting for hours among 57.5% of them. The most common site reported of headache was bifrontal (57.8%) followed by Bi-orbital (40.4%). Time spending on computer, different qualifications and being female were significantly associated with headache ( $P = .049$ ). **Conclusion:** The prevalence of headache is high among radiology department within different qualifications. This study encourages more studies to be established among health care provider for better practice decisions and reducing the global headache burden.

**Keywords:** risk factors, healthcare worker, Saudi Arabia, radiology, headache

## 1. INTRODUCTION

Healthcare workers play a very important role in treating and delivering healthcare for ill and sick people. As they spend many years studying how to treat and deal with sick people and working to active that, they are expected to be aware of how to live a healthy lifestyle. However, numerous studies were done and show how they are at high risk to develop many diseases, because of the healthcare worker's environment (Romito et al., 2020). In study involve all occupational groups in England found the prevalence of obesity is



higher among health care workers (31.9%) in comparison with other workers groups (Kyle et al., 2016). In another study show (34%) of healthcare workers had a metabolic disease, (28.7%) were obese, and (27.3%) were overweight (Garrido et al., 2009). Regarding musculoskeletal diseases, many studies show among healthcare workers, nurses, and dentists to be affected in the early life of their careers, because of the working lifestyle (Mohanty et al., 2019). Neurological disorders like headache are also affecting health care workers, in a study conducted among 645 healthcare workers revealed half of them (50%) suffer from headache (Xie et al., 2020).

Radiology is a growing medical specialty. Computers have become an essential component of clinical radiology. For that, radiology is more visually demanding than other medical specialties (Halpenny et al., 2012). Thus, radiologists spend hours on screen. As a result, they suffer from various diseases (Atwal et al., 2017). One of them is ophthalmic health problems, many studies were conducted to assess the prevalence of eye-straining, a study showed among radiologist who wears monofocal corrective lenses, also female and elderly have a higher incidence of eye-straining (40%) (Thomson, 1998). Among American radiologists, it is estimated (36%) suffer from eye-straining (Vertinsky & Forster, 2005). In Saudi Arabia a study conducted among 198 participants, (50.5%) suffer from eye strain (Al Dandan et al., 2021). A cross-sectional study was carried out among 198 Saudi radiologists that showed being a female with aged between 30-39 years old and working on CT or ultrasound were significantly associated musculoskeletal symptoms (Al Shammari et al., 2019).

There is another problem affecting the radiologist, which is neurological symptoms, there is a study which was conducted in China radiology department had higher incidence of headache when compared to other speciality (Xie et al., 2020). Headache considers the commonest neurological disorder in the community, especially in the working population (Linde et al., 2012). Headache is one of the top ten disabling disorders worldwide (Vos et al., 2012). It causes a significant burden on its affected patients and impairing daily function especially when accompanied by other symptoms, so it affects the quality of life. According to the World Health Organization (WHO), (1.7 - 4%) of the adult population of the world have headaches on 15 or more days every month (WHO, 2016).

There is limited data regarding primary headache in radiology section workers including technicians and radiology doctors. Therefore, the aim of this study is to estimate the current prevalence of primary headache among workers in the radiology department in AlAhsa, Eastern province in Saudi Arabia.

## 2. MATERIAL AND METHODOLOGY

An observational cross-sectional study was conducted during the period of July to October 2021 in multicenters among radiology department in Al Ahsaa, eastern province, Saudi Arabia. The data were collected through a structure self-administrated questionnaire distributed online. This questionnaire composed of four sections. The first section includes the sociodemographic data such as age, gender. The second section is about occupational characteristic such as position in radiology department, working hours, and daily spending hours on computer, institution as public or private hospital. Third section is about characteristic of the headache including type, site, duration, frequency, intensity and associated symptoms.

### Data analysis

After data were extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including participant's demographic data, job title, work hours, medical history, and headache frequency, type, severity, and associated symptoms. Cross tabulation was done to assess the relation between participant's headache experience and all related bio-demographic data, job title, and work load using Pearson chi-square test and exact probability test for small frequency distributions.

## 3. RESULTS

Table 1 shows a total of 133 workers in radiology department in Al-Ahsaa, Eastern region, Saudi Arabia and fulfilling the inclusion criteria completed the study questionnaire. Participant's ages ranged from 23 to 59 years with a mean age of  $30.6 \pm 11.8$  years old. Exact of 96 (72.2%) participants were females. Chronic health problems were detected among 17 (12.8%) where 8 (47.1%) of them were diabetic, 4 (23.5%) were hypertensive, and 5 (29.4%) had other diseases. Only 4 (3%) had psychiatric history, and 6 (4.5%) had neurological disease. Regarding BMI, 59 (44.4%) had normal weights, 49 (36.8%) had overweight, and 22 (16.5%) were obese. Considering job title, 13 (9.8%) were consultants, 24 (18%) were Radiologist specialists, 22 (16.5%) were Radiology technician, 16 (12%) were Resident Radiologist, while 58 (43.6%) were Radiology technologists. Exact of 46 (34.6%) work at radiology department

for 1-5 years while 39 (29.3%) work for more than 10 years. As for daily work hours on computer, 21 (15.8%) work for 2-4 hours daily, 32 (24.1%) work for 4-6 hour daily, and 70 (52.6%) work for more than 6 hours daily.

**Table 1** Bio-demographic data of radiology department staff, Al-hasa, Saudi Arabia

Bio-demographic data	No	%
Age in years		
23-25	23	17.3%
26-30	44	33.1%
31-35	24	18.0%
36-40	18	13.5%
> 40	24	18.0%
Gender		
Male	96	72.2%
Female	37	27.8%
Do you have any chronic diseases?		
Yes	17	12.8%
No	116	87.2%
If yes, what are the diseases		
DM	8	47.1%
HTN	4	23.5%
Others	5	29.4%
Do have any psychiatric history?		
Yes	4	3.0%
No	129	97.0%
Do you have any neurological disease?		
Yes	6	4.5%
No	127	95.5%
BMI		
Underweight	3	2.3%
Normal weight	59	44.4%
Overweight	49	36.8%
Obese	22	16.5%
Job title		
Consultant	13	9.8%
Radiologist specialist	24	18.0%
Radiology technician	22	16.5%
Radiology technologists	58	43.6%
Resident Radiologist	16	12.0%
Work duration in years		
< 1 year	22	16.5%
1-5	46	34.6%
5-9	26	19.5%
10+	39	29.3%
Approximately, how many hours do you use the computer for daily working?		

< 2 hours	10	7.5%
2-4 hours	21	15.8%
4-6 hours	32	24.1%
> 6 hours	70	52.6%

Table 2 shows Exact of 106 (79.7%) of the radiology department staff complained of headache in the last year. The headache attack lasts for hours among 61 (57.5%) of them and for days among 11 (10.4%). As for headache pain location, the most reported was bifrontal (57.8%), Bi-orbital (40.4%), bitemporal (36.7%), while 26.6% complained of generalized headache. Regarding headache pain nature, it was pressure pain among 39.4%, throbbing pain among 36.7%, steady ache (29.4%), nuchal tenderness among 21.1%, and band-like pain among 21.1% but sharp stabbing pain was reported among 9.2%. Pain was described as moderate among 67% of those with headache; while severe pain was reported by 12.8%; of them 9.2% told it is variable in intensity. Considering accompanying symptoms, fatigue was the most reported (55%), followed by phonophobia (48.6%), photophobia (45%), impaired concentration (40.4%), decreased physical activity (36.7%) while aura was reported among 1 case.

**Table 2** Prevalence of headache and related clinical data among radiology department staff, Al-hasa, Saudi Arabia

Headache data	No	%
Have you had a headache in the last year not related to flu, hangover, cold or head injury?		
Yes	106	79.7%
No	27	20.3%
Headache Duration		
Seconds	5	4.7%
Minutes	29	27.4%
Hours	61	57.5%
Days	11	10.4%
Location of headache pain		
Bifrontal	63	57.8%
Bi-orbital	44	40.4%
Bitemporal	40	36.7%
Generalized	29	26.6%
Occipito-nuchal	24	22.0%
Vertex	20	18.3%
Unilateral	13	11.9%
Others	6	5.5%
Nature of headache pain		
Pressure	43	39.4%
Throbbing	40	36.7%
Steady ache	32	29.4%
Nuchal tenderness	23	21.1%
Band-like	23	21.1%
Tight	22	20.2%
Nuchal stiffness	19	17.4%
Sharp/Stabbing	10	9.2%
Others	4	3.7%
Pain intensity		
Slight	12	11.0%
Moderate	73	67.0%
Severe	14	12.8%

<i>Variable</i>	10	9.2%
Accompanying Symptoms		
<i>Fatigue</i>	60	55.0%
<i>Phonophobia</i>	53	48.6%
<i>Photophobia</i>	49	45.0%
<i>Impaired concentration</i>	44	40.4%
<i>Impact on Physical Activity</i>	40	36.7%
<i>Nausea</i>	28	25.7%
<i>Blurring of vision</i>	19	17.4%
<i>Tender scalp</i>	18	16.5%
<i>Vomiting</i>	3	2.8%
<i>Aura</i>	1	.9%

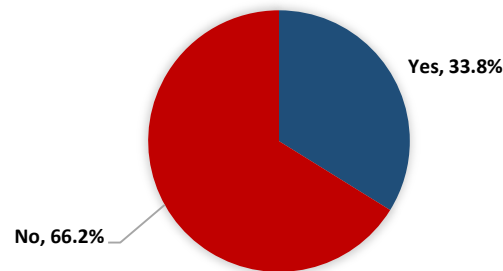
Table 3 shows Headache and associated risk factors. Exact of 89.2% of females had a primary headache during last year compared to 76% of males with recorded statistical significance ( $P=.046$ ). Headache was also reported among 91.7% of radiology specialists versus 53.8% of consultants with statistically significant difference ( $P=.047$ ). Also, 87.1% of radiology staff who use computer for more than 6 hours daily had headache in comparison to 60% of those who use computers for less than 2 hours ( $P=.049$ ). Figure 1 shows prevalence of migraine headache among radiology department staff bi-demographic data. Exact of 45 (33.8%) of the staff complained of migraine headache while 88 (66.2%) never experienced migraine headache.

**Table 3** prevalence of headache and associated risk factors

Bio-demographic data	Headache				p-value
	Yes		No		
	No	%	No	%	
Age in years					
23-25	17	73.9%	6	26.1%	.540 <sup>s</sup>
26-30	37	84.1%	7	15.9%	
31-35	21	87.5%	3	12.5%	
36-40	14	77.8%	4	22.2%	
> 40	17	70.8%	7	29.2%	
Gender					
Male	73	76.0%	23	24.0%	.046*
Female	33	89.2%	4	10.8%	
Do you have any chronic diseases (DM, HTN, SCD...etc)?					
Yes	13	76.5%	4	23.5%	.723
No	93	80.2%	23	19.8%	
Do have any psychiatric history?					
Yes	4	100.0%	0	0.0%	.305 <sup>s</sup>
No	102	79.1%	27	20.9%	
Do you have any neurological disease?					
Yes	6	100.0%	0	0.0%	.206 <sup>s</sup>
No	100	78.7%	27	21.3%	
BMI					
Underweight	2	66.7%	1	33.3%	.488 <sup>s</sup>
Normal weight	44	74.6%	15	25.4%	
Overweight	42	85.7%	7	14.3%	
Obese	18	81.8%	4	18.2%	
Job title					.047*

<i>Consultant</i>	7	53.8%	6	46.2%	
<i>Radiologist specialist</i>	22	91.7%	2	8.3%	
<i>Radiology technician</i>	19	86.4%	3	13.6%	
<i>Radiology technologists</i>	44	75.9%	14	24.1%	
<i>Resident Radiologist</i>	14	87.5%	2	12.5%	
<b>Work duration in years</b>					
<i>&lt; 1 year</i>	17	77.3%	5	22.7%	
<i>1-5</i>	39	84.8%	7	15.2%	.771
<i>5-9</i>	20	76.9%	6	23.1%	
<i>10+</i>	30	76.9%	9	23.1%	
<b>Approximately, how many hours do you use the computer for daily working?</b>					
<i>&lt; 2 hours</i>	6	60.0%	4	40.0%	
<i>2-4 hours</i>	16	76.2%	5	23.8%	.049**
<i>4-6 hours</i>	23	71.9%	9	28.1%	
<i>&gt; 6 hours</i>	61	87.1%	9	12.9%	

P: Exact X2 test  
\$: Exact probability test  
\*P < 0.05 (significant)



**Figure 1** prevalence of migraine headache among radiology department, AlAhsa, Saudi Arabia

#### 4. DISCUSSION

A headache is mainly pain in the head or upper neck. Headache may be primary which is no diagnosed medical condition behind or secondary with associated injury or medical condition (Almutlq et al. 2021). Types of primary headaches are migraine, tension headache, and cluster headaches (Kanho et al. 2021). Mostly, headaches don't mean a serious medical condition. Though, person should seek medical consultation if the attacks are severe or unusual, does not respond to treatment and worsens over time (Robbins et al., 2010; Olesen, 2008). As radiologists' main task is to read and analyse medical diagnostic images, radiology featured by Haigh visual demands than other medical specialties (Halpenny et al., 2012). Recently, computers have become an important factor of clinical radiology. Furthermore, the workload of radiologists has considerably increased with enhancements in medical technology (Bhargavan et al., 2009). Thus, radiologists had to stay for long durations using computers, so, becoming subject to digital eye strain (Rohatgi et al., 2015; Waite et al., 2017).

Many studies reported that the prolonged use of digital device causes altered blinking patterns with reduced rate and incomplete blinking (Jansen et al., 2010; Patel et al., 1991; Portello et al., 2012). This may cause eye dryness with digital eye strain causing changes in the visual accommodation and convergence (Krupinski and Berbaum, 2009). By the end of radiology's clinical day, the accommodation for near vision is impaired (Grandjean and Vigliani, 1980), which has a significant impact on their concentration with associated headache attacks. The current study aimed to estimate prevalence of headache among workers in radiology department in Al-Ahsa, Eastern region, Saudi Arabia with its associated factors.

The study results showed that more than three quarters (79.7%) of the study radiology staff complained of headache in the last year. The headache attacks were for hours among more than half of the staff. The most reported sites of headache pain were

bifrontal (57.8%), Bi-orbital (40.4%), and bitemporal (36.7%). About one quarter of the radiologists had generalized headache. One third of the study participants had pressure pain, and also one thirds complained of throbbing pain. Pain was steady among nearly 30% of the study participants. About two thirds of the pain attacks reported among the radiologists were moderate while nearly 1 out of each 10 had variable intensity attacks. The most reported symptoms included fatigue and photophobia (nearly about half of the cases), photophobia (45%), and impaired concentration with affected daily activities.

No similar studies assessed the prevalence of headache among radiologists but many studies assessed among health care and emergency staff. AlDandan et al., (2021) studied digital eye strain among radiologists in Saudi Arabia. Authors concluded that about 27% did eye examination as regular check-up and half (50.5%) experienced digital eye strain. The guidelines on the work with prolonged screen equipment recommended having a break 5- to 10-minutes after one-hour of being on screen work and 15-minutes break every 2 hours. Besides, studies also estimated that the work output between breaks improves. The long-time computer user should apply the 20-20-20 rule in which 20 second break after 20 minutes on screen with a distance of 20 feet (Grandjean and Vigliani, 1980).

As for the factors associated with headache complaint among radiologists, females showed higher prevalence than males which is the same finding among all population which may be associated with not only work nature but female related health issues (Misawa et al., 1984). Also, radiology specialists and residents had the highest experience of headache attacks than consultants who had less duty and so spent less time reading images using computer screens. More work hours using computer was also associated with higher prevalence of headache among radiologists due to prolonged concentration and eye strain.

## 5. CONCLUSION

Primary headache attacks were common among different staff of radiology department especially residents and specialists who spend more time using computer screens. Eye strain is common among radiologists causing radiologist fatigue. Taking breaks for a while at least every hour, shortens workday length, avoiding computer screen flicker, and applying some eye relieve strategies may decrease primary headache attacks.

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### Author contribution

All authors of this study were equally involved in the design of the study, data collection, analysis, drafting and correction of the final draft, and the author was responsible for the proper implementation of the study at all stages. There is no author whose name is not listed in the authors list.

### Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

### Ethical approval

The study was approved by the King Fahad Hospital-Hofuf (ethical approval code: 40-EP-2021).

### Funding

This study has not received any external funding.

### Conflict of Interest

The authors declare that there are no conflicts of interests.

### Data and materials availability

All data associated with this study are presented in the paper.



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